



# Surface Methane Gas Monitoring at the Arecibo Municipal Solid Waste Landfill

**Quarterly Event Report** 

Prepared by: Landfill Technologies of Arecibo, LLC.

October to December 2020

#### **Table of Contents**

Introduction	3
Objectives	3
Description	
Sampling Locations and Results	
Conclusions and Recommendations	4
Appendixes	5
Appendix A: Thermo Scientific Portable Toxic Analyzer – TVA1 Surface Emission Monitor Specifications Appendix B: Sampling Points Locations form Arecibo Municip	

Appendix C: Surface Emission Readings

#### Introduction

Landfill Technologies of Arecibo, LLC (LTA) has conducted on October, November and December of 2020 the surface and perimeter methane gas monitoring event at the Arecibo Municipal Solid Waste Landfill as part of the operation of the Gas Collection and Control System (GCCS). This event is also performed as part of the state and federal agency's for environment requirements for solid waste landfills.

The surface methane gas monitoring was performed by Landfill Technologies of Arecibo, LLC (LTA) personnel during December 2<sup>nd</sup> and 3<sup>rd</sup>, 2020 according to the following rule of the "Enmiendas al Reglamento para el Control de la Contaminación Atmosférica de la Junta de Calidad Ambiental para cumplir con los requisitos para Planes Estatales de la Sección 111 (d) de la Ley Federal de Aire Limpio para Implantar las Guías de Emisiones para Sistemas de Relleno Sanitario". This monitoring consisted of obtaining readings with a portable instrument (TVA1000B) surface detector, please refer to Appendix A for specifications of instrument) from landfill surface, groundwater monitoring wells, gas collection system and ambient monitoring.

#### **Objectives**

The objective of this event (the surface methane gas monitoring) is to ensure that the concentration of methane (CH<sub>4</sub>) generated by the landfill does not exceed the lower explosive limit (LEL) of methane at the facility. The LEL for this monitoring is 500 ppm (parts per million) or 25%. If the personnel of LTA detect any release that exceeds the LEL it will require notification to the owner or operator and an expansion of the monitoring program to determine the vertical and horizontal extent of the release.

#### Description

The surface methane operational standards consist of monitoring the surface emissions of methane along the entire perimeter of the collection area and along a serpentine patter 30 meter apart (or site specific established spacing) for each collection area using a portable surface detector (TVA1000B – Appendix A).

### Sampling Locations and Results

Landfill Technologies of Arecibo, LLC has created samplings locations at the Arecibo Municipal Solid Waste Landfill site where the surface emission readings have been collected. LTA presents the sampling locations at Appendix B. These readings were collected with the portable surface detector (TVA1000B) and are presented in Appendix C.

#### **Conclusions and Recommendations**

The surface emissions readings were performed for October, November and December of 2020 monitoring event from the Arecibo Municipal Solid Waste Landfill. This monitoring is part of conclusions quarterly monitoring program aimed to detect abnormal gas release at the landfill. During this event of monitoring the active area (area where the waste was deposited) was located at South-East side of the landfill. The LTA personnel inspect the area and there were no cracks that present a hazard to the surface.

The results of the surface emission monitoring for October, November and December of 2020 events by LTA personnel indicates that during that period no sampling point monitored exceed the LEL for methane which means that the landfill location does not represent a high risk of explosiveness.



### APPENDIX A

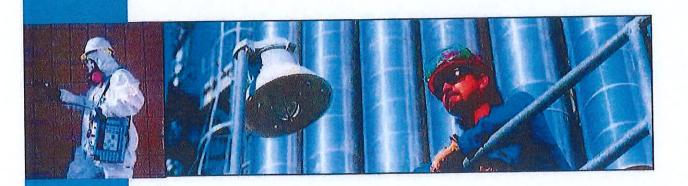
Thermo Scientific Portable Toxic Analyzer – TVA1000B Surface Emission Monitor Specifications Thermo Scientific TVA1000B Toxic Vapor Analyzer





The Only Portable Intrinsically Safe Dual PID/FID Analyzer





#### **Portable Toxic Vapor Analyzer**

The Thermo Scientific TVA1000B is the only over-the-shoulder portable vapor analyzer that offers both PID (Photo Ionization Detection) and FID (Flame Ionization Detection) in a single, easy-to-use instrument. The ability to utilize both technologies in this field proven instrument provides benefits in reduced weight and a single user interface. The user can easily monitor and log inorganic and organic vapors simultaneously.

#### **FID Detection**

Users can measure a wide variety of organic vapors over an impressive dynamic range (0-50,000 ppm), monitoring some compounds that the PID will not detect. The flame ionization detector operates by breaking hydrocarbon bonds and is not limited by a low ionization potential of the molecule.

#### Simultaneous FID/PID Detection

No other instrument offers both Photo Ionization and Flame Ionization Detection operating simultaneously in a single portable vapor analyzer. Dual detection eliminates the time, expense and trouble of purchasing and maintaining two separate analyzers.

With PID detection, the user has not only the ability to monitor for organic compounds, but also can detect many inorganic compounds. Some compounds detected by PID and not FID are ammonia, carbon disulfide, carbon tetrachloride, formaldehyde, and hydrogen sulfide. The PID also has the advantage of not requiring fuel or air to operate. In anaerobic environments, the TVA1000B PID can be used.



#### **Key Features**

- Simultaneous FID/PID or Single FID detector(s)
- · Portable and lightweight
- Multiple response factors and curves
- Multi-point calibration
- On-board datalogging
- 8 hour battery life

#### **Probe Options**

#### **Standard Probe**

Display measurement values on a 4-character LCD, with measurement units displayed on %, ppm, or ppb. Additionally, a bar graph indicator provides an indication of concentration level. Function keys allow selection of analyzer functions.

#### **Enhanced Probe**

Originally designed for Fugitive Emissions monitoring, the enhanced probe has a larger display area than the basic probe. This provides a display of up to 6 lines x 20 characters, plus a double height concentration value. It displays all the same information as the standard probe and has menu-driven access to many of the analyzer functions, allowing them to be easily initiated and/or changed at the probe.



#### TVA1000B Data Manager Accessory: Route Management Probe

Powerful field capabilities

The TVA1000B Data Manager allows users to modify or create route data in the field, eliminating the need for manual recording of data. This helps you comply with the electronic data storage requirements within most consent decrees. The probe has a highly visible 360 degree LED with a pulsed rate linked to concentration.

The DataManager provides access to all of the features previously available only through the sidepack. Users can also easily search and navigate between tags in a route by simply entering the desired tag identifier.

Flexibility and control

The DataManager allows control of how data is viewed and accessed in the field. This allows the user to customize the view to best meet the monitoring needs at your facility, as each route may have different fields and screen displays. Fields may be designated as non-editable to enhance data integrity and database security.

An optional comment field allows the user to make electronic notes about each tag monitored. An alpha-numeric keypad makes data entry a snap.

#### **Key Features for the DataManager**

- Custom field labels for more clearly identified route information
- Definable screen layouts optimize user efficiency
- Pick lists lead to consistent data entry and minimize chance of data entry errors
- One button selections to access most commonly used functions
- New sample probe provides 360 degree visual indicator of concentration level
- Cable management system eliminates snagging sample line and electronic cable
- Existing TVA1000 units may be upgraded
- Enhanced filtering system removes dirt and water more efficiently.



Analyzer bag protects TVA1000 and may be used with standard shoulder strap or optional framed backpack

#### **ThermoConnect Software**

ThermoConnect enables users of the TVA1000B to transfer, display, analyze, and configure data from the instrument using a computer. ThermoConnect is Windows® based and facilitates the importing of data into other Windows® based applications making it easier to retrieve logged data.

## Added capability to maximize the TVA DataManager's features

ThermoConnect has been updated with a powerful new utility to create new route database template files. This utility allows you to easily build your own route database and design the screen appearance through a four-step process. Also, any existing route files in the old file format are still recognized by the TVA and may be upgraded to the new format.

Windows® is a registered trademark of Microsoft Coporation.



Conclute DataMarager System

#### **Applications**

Fugitive Emissions Monitoring
The unique dual detector FID/PID
design can handle a wide range of
compound vapors present at processing plants. The TVA1000B permits
monitoring at lower ppm levels.

**Emergency Response** 

For reliable measurements of hazardous spills or emissions, the TVA1000B responds quickly in an emergency. The ability to quickly detect the presence of "hot spots" is key to locating the source of the hazard.

Hazardous Waste Site Evaluation The TVA1000B allows quick and easy identification of the hazard location and quantifies the level of contamination.

Underground Storage Tanks
The TVA1000B is a primary tool for
determining if a UST is leaking and
the extent of the contamination.

**Industrial Hygiene** 

The TVA1000B can help you maximize the effectiveness of your plant ventilation system, and identifies trouble spots. Use it to survey ambient vapor levels in specific breathing zones or in general plant environments, and log for furthur follow-up action.

Natural Gas Leak Detection The TVA1000B enables quick and easy detection of natural gas leaks.

The Thermo Scientific **TVA1000B** is a benchmark for experience and reliability in Fugitive Emissions Monitoring

### Thermo Scientific TVA1000B Specifications

Safety certifications	FM (Class 1, Div. 1, Groups A,B,C&D Hazardous Location, Temp. Class T4)
Datalogging	Onboard
Readout	Bar graph & 4- digit LCD
Dynamic Range	0.5-2,000 ppm (PID) isobutylene; 0.5-50,000 ppm (FID) methane
Linear Range	0.5-500 ppm (PID) isobutylene; 0.5-10,000 ppm (FID) methane
Response Time	3.5 seconds
Minimum Detectable Limit	100 ppb benzene (PID); 300 ppb hexane (FID) (laboratory conditions)
Alarms	Low, high, STEL
Sample Flow Rate	1,000 cc/min nominal
Power	Rechargeable NiCd Battery
Logging Capacity	900-18,000 points mode specific
Temperature Range	0-40°C (32°F - 104°F)
Fuel	None required (PID); 99.995% hydrogen (FID)
Portable Operation Time	8 hours (with reference operating conditions)
Approximate Mass	5.8 kg (13 pounds)
Nominal Dimensions	13.5 x 10.3 x 3,2 inches (343 x 252 x 81 mm)
	0-2V dc (non-calibrated)
Analog Output	
Repeatability	+/- 1% (PID); +/- 2% (EID)
Autoranging	Yes
Diagnostics	Yes
Other Available Options: Carrying Case Charcoal Filter	P/N CR012XL P/N 510095-1
FID Calibration Kit PID/FID Calibration Kit	P/N CR009UY P/N CR012UH

Thermo Scientific products represent a broad range of high-end analytical instruments, chemistry and consumable supplies, laboratory equipment, software and services that enable integrated laboratory workflow solutions. Thermo Scientific is the new name for a trusted brand — Thermo Electron — that the world's most renowned researchers, clinicians and scientists already count on to solve their analytical challenges. The brand is strengthened by the additions equipment, consumables and reagents acquired from Fisher Scientific.



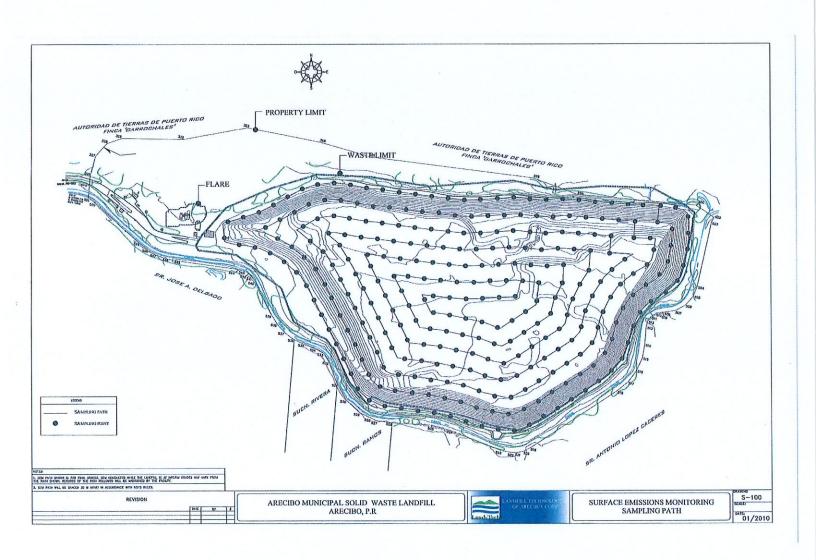
Lit\_TVAEID\_0707





### **APPENDIX B**

Sampling Points Locations from Arecibo Municipal Landfill





### APPENDIX C

Surface Emission Readings

was 1	5475	DETECTOR	CONCENTRATION	CONCENTRATION UNIT
TAG	DATE	DETECTOR	CONCENTRATION	CONCENTRATION UNIT
DOWNWIND	2-Dec-20	FID	0.48	PPM
UPWIND	2-Dec-20	FID	2.04	PPM
POINT1	2-Dec-20	FID	0.85	PPM
POINT2	2-Dec-20	FID	1.29	PPM
POINT3	2-Dec-20	FID	6.28	PPM
POINT4	2-Dec-20	FID	0.33	PPM
POINT5	2-Dec-20	FID	0.61	PPM
POINT6	2-Dec-20	FID	1.48	PPM
POINT7	2-Dec-20	FID	1.18	PPM
POINT8	2-Dec-20	FID	4.04	PPM
POINT9	2-Dec-20	FID	2.83	PPM
POINT10	2-Dec-20	FID	2.52	PPM
POINT11	2-Dec-20	FID	0.58	PPM
POINT12	2-Dec-20	FID	2.9	PPM
POINT13	2-Dec-20	FID	1.3	PPM
POINT14	2-Dec-20	FID	6.45	PPM
POINT15	2-Dec-20	FID	1.4	PPM
POINT16	2-Dec-20	FID	13	PPM
POINT17	2-Dec-20	FID	6.31	PPM
POINT18	2-Dec-20	FID	3.12	PPM
POINT19	2-Dec-20	FID	9.16	PPM
POINT20	2-Dec-20	FID	8.14	PPM
POINT21	2-Dec-20	FID	9.97	PPM
POINT22	2-Dec-20	FID	15.69	PPM
POINT23	2-Dec-20	FID	13.88	PPM
POINT24	2-Dec-20	FID	13.01	PPM
POINT25	2-Dec-20	FID	1.37	PPM
POINT26	2-Dec-20	FID	1.44	PPM
POINT27	2-Dec-20	FID	4.44	PPM
POINT28	2-Dec-20	FID	5.22	PPM
POINT29	2-Dec-20	FID	2.66	PPM
POINT30	2-Dec-20	FID	2.82	PPM
POINT31	2-Dec-20	FID	2.22	PPM
POINT32	2-Dec-20	FID	3.25	PPM
POINT33	2-Dec-20	FID	0.57	PPM
POINT34	2-Dec-20	FID	0.72	PPM
POINT35	2-Dec-20	FID	0.75	PPM
POINT36	2-Dec-20	FID	0.02	PPM
POINT37	2-Dec-20	FID	0.53	PPM
POINT38	2-Dec-20	FID	5.51	PPM
POINT39	2-Dec-20	FID	6.69	PPM
POINT40	2-Dec-20	FID	1.72	PPM
POINT41	2-Dec-20	FID	1.14	PPM
POINT42	2-Dec-20	FID	2.93	PPM

TAG	DATE	DETECTOR	CONCENTRATION	CONCENTRATION UNIT
POINT43	2-Dec-20	FID	19.12	PPM
POINT44	2-Dec-20	FID	8.06	PPM
POINT45	2-Dec-20	FID	1.73	PPM
POINT46	2-Dec-20	FID	9.19	PPM
POINT47	2-Dec-20	FID	9.29	PPM
POINT48	2-Dec-20	FID	3.11	PPM
POINT49	2-Dec-20	FID	1.86	PPM
POINT50	2-Dec-20	FID	5.2	PPM
POINT51	2-Dec-20	FID	4.36	PPM
POINT52	2-Dec-20	FID	7.85	PPM
POINT53	2-Dec-20	FID	2.31	PPM
POINT54	2-Dec-20	FID	0.65	PPM
POINT55	2-Dec-20	FID	176.28	PPM
POINT56	2-Dec-20	FID	11.18	PPM
POINT57	2-Dec-20	FID	6.32	PPM
POINT58	2-Dec-20	FID	8.1	PPM
POINT59	2-Dec-20	FID	169.05	PPM
POINT60	2-Dec-20	FID	10.72	PPM
POINT61	2-Dec-20	FID	87.71	PPM
POINT62	2-Dec-20	FID	30.13	PPM
POINT63	2-Dec-20	FID	2.69	PPM
POINT64	2-Dec-20	FID	31.57	PPM
POINT65	2-Dec-20	FID	14.71	PPM
POINT66	2-Dec-20	FID	6.04	PPM
POINT67	2-Dec-20	FID	165.44	PPM
POINT68	2-Dec-20	FID	123.11	PPM
POINT69	2-Dec-20	FID	6.99	PPM
POINT70	2-Dec-20	FID	1.39	PPM
POINT71	3-Dec-20	FID	227.32	PPM
POINT72	3-Dec-20	FID	13.4	PPM
POINT73	3-Dec-20	FID	37.36	PPM
POINT74	3-Dec-20	FID	32.79	PPM
POINT75	3-Dec-20	FID	49.35	PPM
POINT76	3-Dec-20	FID	4.57	PPM
POINT77	3-Dec-20	FID	5.96	PPM
POINT78	3-Dec-20	FID	3.11	PPM
POINT79	3-Dec-20	FID	9.98	PPM
POINT80	3-Dec-20	FID	3.46	PPM
POINT81	3-Dec-20	FID	2.21	PPM
POINT82	3-Dec-20	FID	10.44	PPM
POINT83	3-Dec-20	FID	6.03	PPM
POINT84	3-Dec-20	FID	6.49	PPM
POINT85	3-Dec-20	FID	6.71	PPM
POINT86	3-Dec-20	FID	4.64	PPM

TAG	DATE	DETECTOR	CONCENTRATION	CONCENTRATION UNIT
POINT87	3-Dec-20	FID	15.77	PPM
POINT88	3-Dec-20	FID	2.12	PPM
POINT89	3-Dec-20	FID	9	PPM
POINT90	3-Dec-20	FID	10.93	PPM
POINT91	3-Dec-20	FID	3.59	PPM
POINT92	3-Dec-20	FID	11.65	PPM
POINT93	3-Dec-20	FID	7.68	PPM
POINT94	3-Dec-20	FID	7.32	PPM
POINT95	3-Dec-20	FID	5.32	PPM
POINT96	3-Dec-20	FID	6.79	PPM
POINT97	3-Dec-20	FID	11.76	PPM
POINT98	3-Dec-20	FID	3.90	PPM
POINT99	3-Dec-20	FID	7.36	PPM
POINT100	3-Dec-20	FID	13.57	PPM
POINT101	3-Dec-20	FID	13.35	PPM
POINT102	3-Dec-20	FID	5.47	PPM
POINT103	3-Dec-20	FID	1.15	PPM
POINT104	3-Dec-20	FID	6.42	PPM
POINT105	3-Dec-20	FID	0.34	PPM
POINT106	3-Dec-20	FID	7.78	PPM
POINT107	3-Dec-20	FID	4.29	PPM
POINT108	3-Dec-20	FID	12.81	PPM
POINT109	3-Dec-20	FID	24.7	PPM
POINT110	3-Dec-20	FID	9.67	PPM
POINT111	3-Dec-20	FID	4.43	PPM
POINT112	3-Dec-20	FID	11.91	PPM
POINT113	3-Dec-20	FID	20.61	PPM
POINT114	3-Dec-20	FID	13.95	PPM
POINT115	3-Dec-20	FID	8.2	PPM
POINT116	3-Dec-20	FID	7.95	PPM
POINT117	3-Dec-20	FID	3.26	PPM
POINT118	3-Dec-20	FID	21.74	PPM
POINT119	3-Dec-20	FID	27.36	PPM
POINT120	3-Dec-20	FID	30.17	PPM
POINT121	3-Dec-20	FID	23.22	PPM
POINT122	3-Dec-20	FID	30,15	PPM
POINT123	3-Dec-20	FID	26.48	PPM
POINT124	3-Dec-20	FID	23.59	PPM
POINT125	3-Dec-20	FID	28.07	PPM
POINT126	3-Dec-20	FID	28.46	PPM
POINT127	3-Dec-20	FID	23.34	PPM
POINT128	3-Dec-20	FID	25.11	PPM
POINT129	3-Dec-20	FID	26.54	PPM
POINT130	3-Dec-20	FID	16.6	PPM

TAG	DATE	DETECTOR	CONCENTRATION	CONCENTRATION UNIT
POINT131	3-Dec-20	FID	23.9	PPM
POINT132	3-Dec-20	FID	22.61	PPM